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On how Bohr model of hydrogen atom is connected to nuclear physics

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ABSTRACT

The atom model of Quantum Mechanics (QM) was conceived from an unsolved paradox. Indeed, Schrödinger's equation has been deducted by considering a free electron, but it is applied for the atom, where the electron is inside a potential. In order to eliminate the nonsense, quantum theorists proposed a ridiculous postulate: they claim it makes sense to use the equation because it gives results in agreement to experimental data. The unsolved paradox evidences that Schrödinger's equation cannot be applied to the physical conditions considered in the QM atom model, and that his equation actually requires some special conditions not considered in the theory (for instance, the electron helical trajectory, rejected by Heisenberg). The banishment of the aether has introduced several paradoxes in the development of Theoretical Physics. And because the theorists have neglected other paradox (from the mathematical probability the spectacular successes of Bohr's hydrogen atom cannot be accidental), these two unsolved paradoxes introduced dramatic consequences in the development of Nuclear Physics.

Keywords: Electric field structure, Modified Coulomb's law, Modified Bohr's hydrogen model

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INTRODUCTION

Beyond the paradox regarding the origin of the Schrödinger's equation, there is other intriguing paradox when we compare the successes of the Bohr model with the successes of the atom model of QM, as explained ahead. The Bohr's theory on the hydrogen atom is incompatible with the atom model of QM, since his model is corpuscular, and the atom considered in QM is undulatory. Thus, the first incompatibility arises from the fact that, whereas the electron in the Bohr's hydrogen atom is susceptible to be submitted to a centripetal acceleration, unlike the electron in the atom of QM cannot be submitted to any centripetal acceleration, which cannot actuate on a wave. In spite of the spectacular successes of the Bohr's hydrogen atom model are considered, nowadays, as accidental by the quantum physicists, however from the viewpoint of the mathematical

probability it is practically impossible that they can be resulted of mere coincidences. That's why Schrödinger wrote in a paper; It is difficult to believe that this result is merely an accidental mathematical consequence of the quantum conditions, and has no deeper physical meaning (Schrödinger, 1923). Suppose a quantum theorist says: Yes, I believe that the successes of the Bohr theory are merely accidental. That would be fine if the Science was based on personal beliefs. However, it isn't. Science is based on facts. And the facts (concerning the Bohr theory) are the following.

1- From the mathematical probability, it is impossible that Bohr's successes are merely accidental. Therefore, his theory cannot be hundred percent wrong.

2- According to the calculations in the Bohr's theory, the electron is submitted to a centripetal acceleration when the hydrogen atom emits a photon.

3- As his theory cannot be hundred percent wrong, thus, when the hydrogen atom emits a photon, there must be a mysterious centripetal acceleration on the electron. Probably such centripetal force has not any connection with the mechanism responsible for the emission of photons by the atom, because the mechanism of emission occurs via resonance. Nevertheless, as there must be some mysterious deeper physical meaning in his theory, the centripetal acceleration really exists, and it must play a mysterious and unknown role related to some special condition under which the electron is submitted inside the hydrogen atom.

4- The atom model of QM is incompatible with any sort of centripetal acceleration on the electron, when the atom emits photons. Therefore, in order the atom model of QM being hundred percent correct, the Bohr's theory must be hundred percent wrong, and there is not any centripetal acceleration on the electron. This is a fundamental requirement so that the atom model of QM must be hundred percent correct.

5- But as it's impossible that Bohr's theory is hundred percent wrong (and thus the centripetal acceleration on the electron really exists) this imply that the atom model of QM cannot be hundred percent correct. Or, in other words: something with very deep physical meaning is missing in the atom model of QM.

PHYSICAL STRUCTURE OF ELECTRIC FIELDS OF THE PROTON AND ELECTRON

It is shown in a paper that the vacuum permeability and permittivity may originate from the magnetization and the polarization of continuously appearing and disappearing fermion pairs of the vacuum (Urban, Couchot, Sarazin, & Djannati-Atai, 2013). Several experimental findings, published along the last 15 years, are suggesting that the space is no empty (Wilson et al., 2011), and we are suggested to suppose that the quantum vacuum has a physical structure, formed by particles of a new sort of aether, different of that old classical luminiferous-aether imagined in the 19th Century: a new non-luminiferous aether (Cruz, 2016). Concerning such controversial subject, the aether, since 1919 the physicists have neglected, it seems purposely, an historical fact, and along several decades it was even forgotten for many generations of physicists. Although Einstein is widely credited with abolishing the ether concept, he actually introduced a new relativistic ether in 1916, developing the idea in his later works. A book relates the story of Einstein and the rebirth of the ether, demonstrating how Einstein came to reject the 19th century ether. It details three relativistic ether models developed by Einstein and Einstein's treatment of spacetime as a material entity-a *New ether* (Kostro, 2000). The May 29 total solar eclipse in 1919, observed from Brazil and Principe were analyzed by Eddington and the general relativity predictions agreed with the observation. The warping of space-time by the sun's mass was real and Newton's inert space had been superseded by a new theory. When the New York Times published the news on Nov. 7, 1919, Einstein became known not only to scientists, but to non-scientists as well. Now, one hundred years after the solar eclipse in 1919, a new experiment can prove that Einstein's theory is being superseded by the Symmetric Special Relativity (SSR) developed by Cláudio Nassif da Cruz. He proposes the existence of an invariant minimum speed connected to the fundamental vacuum state, i.e., a new aether that leads us to understand the origin of the cosmological constant or the cosmological anti-gravity in a de Sitter scenario (Cruz, dos Santos, & Amaro de Faria, 2018).

Nassif has also proposed an experimental route for testing the existence of such a minimum speed (aether) that breaks down the Lorentz symmetry in the infrared (IR) regime by considering a ultra-cold Sodium Potassium dipolar gas ($Na^{23} - K^{40}$) thermalized with the radioactive isotope single atom (Na^{25}) working like an atomic clock close to a minimum temperature ($T_{min} \sim 10^{-12} K$) (Nassif, 2017).

Thus, according to Nassif's SSR, one expects that the proper time of such an atomic clock (Na^{25}) moving close to V(T_{min}) in thermal equilibrium with the ultracold dipolar gas is dilated with respect to the improper time given in lab, i.e., the proper time at the ultracold systems (ultra-cold atomic clocks) elapses faster than the improper one for an observer in lab, thus leading to a new effect on the time so-called "proper time dilation", so that the atomic decay rate of a ultracold radioactive sample (Na^{25}) becomes larger than the decay rate of the same sample at room temperature. This means a suppression of the half-life time of a radioactive sample thermalized with a ultracold cloud of dipolar gas to be investigated in the Cold Atom Lab (CAL) put in the Earth orbit by NASA, in August 2017. The confirmation of the experimental result for the ultra-cold atomic clocks in CAL will also represent a significant step for understanding this new interpretation of the origin of the mass due to the aether, which will allow us to get a fundamental comprehension of the structure of the neutrino. After this comment about these surprises which the aether can be reserving to the scientific community in the upcoming months, and others along upcoming years, let us go back to that paper published by Urban, Couchot, Sarazin, & Djannati-Atai, in (2013). They have supposed that the vacuum (aether) is filled with elementary fermions, and the reason why they have postulated only two fermions is because, in their paper, they were dealing with a mechanism concerning the light propagation in the vacuum. However, obviously the structure of the aether is more complex, because it must be composed by several other sort of particles, as gravitons, magnetons, gluons, and other ones. And as herein we will deal with a more complex mechanism (which is regarding the emission of photons by the atoms), we have to consider more than a single electric fermion pairs (which here we will call *electricitons*). Consider that, according to Urban et al. (2013) in a P point very far away of any presence of any particle with mass (as the proton or electron), the space is filled by a soup of appearing and disappearing electricitons pairs, with negative and positive electric charges. Suppose that the body of a spinning proton is

created at that P point, where the electricitons pairs in the aether were in the status of an amorphous configuration, being appearing and disappearing. In the moment when the proton is created, immediately the positive electricitons stop of appearing and disappearing, being captured by the proton and start to move with the speed of light toward radial directions regarding the center of the proton, as shown in the Figure 1.

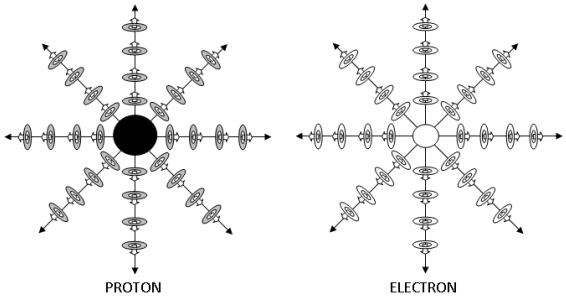

Fig1. The electric fields of the proton and electron, composed by fluxes of electricitons of the aether, moving with the speed of light

Those fluxes of positive electricitons compose several strings, which origin is the proton body. The same happens if the body of a spinning electron would be created in the P point, and the sole difference is that, in the case of the electron, negative electricitons are captured. Those positive electricitons, captured by the proton, continue belonging to the "aether soup of appearing and disappearing electricitons" (which fills the space of the universe), but after being captured and aligned thanks to the proton spinning, they constitute its electric field (not more appearing and disappearing), and that electric field is entangled with the rest of the universe. Then, if that proton electric field interacts with a field of a magnet, and the proton field is pulled, then the spinning body of the proton moves together, pulled by its electric field, because the proton and its electric field are strongly bound, in spite of its electric field actually belongs to the rest of the universe., whereas the proton body does not belong. The same occurs with the electron. The proton charge $q = +1.6 \times 10^{-19} C$ is produced by this field composed of electricitons.

THREE POSTULATES FOR THE INTERACTIONS BETWEEN FLUXES OF ELECTRICITONS

Postulate 1

The magnitude, of the interaction force between two fluxes of electricitons depends on the relative direction between the fluxes.

Postulate 2 : Strong electric interaction

In the region between the proton and the electron, the flux of positive and negative electricitons occurs with them having contrary direction, as seen in the Figure 2. Such interaction produces a force of attraction, in attempting to promote a perfect concentric superposition of the electric fields of the proton and electron. From Figure 2(A), we realize that, as smallest is the angle β between the two fluxes, stronger is the interaction. For instance, in the Figure 2(A), the interaction between the fluxes E_2 and f-5 is stronger than between E_2 and f-4. The interaction force between two fluxes is maximum when they occur along the same line, with $\beta = 0$.

Postulate 3: Weak electric interaction

In the region outside the proton and electron, as seen in Figure 2(B), the fluxes of the positive and negative electricitons move with small relative speed. Such interaction produces a force of repulsion, in attempting to promote the separation of the two fields. Note that, the smaller is the angle α between two fluxes, weaker is the interaction. For instance, in the Figure 2(A) the interaction between the fluxes E_1 and f-1 is weaker than between E_1 and f-2. It is null the interaction force between two fluxes forming an angle $\alpha = 0^0$, because the relative speed between them is zero.

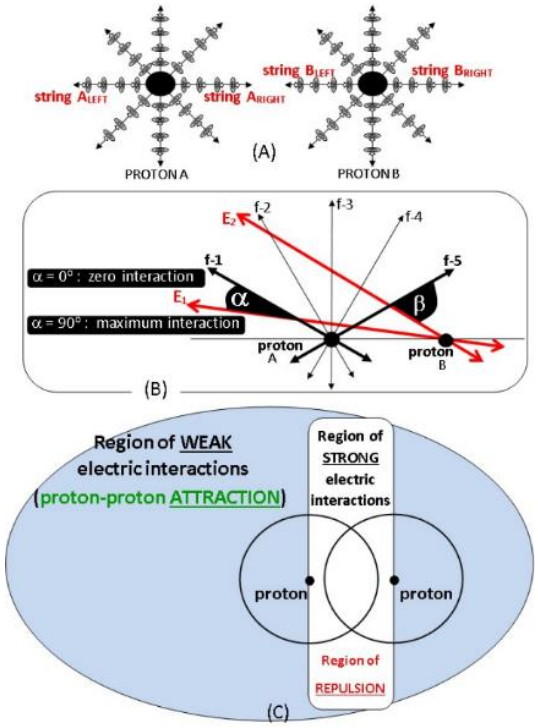

Fig 2. Two sort of electrical interactions between electric fields

In the Figure 2, in the region of strong electric interactions, the positive and negative electricitons interact having contrary spins, and contribute with an attraction force between the electric fields of proton and electron. In the region of weak electric interactions, the positive and negative electricitons interact having parallel spins, and thereby contribute with a repulsion force between the electric fields of proton and electron.

According to the laws of strong electric interactions proposed herein, if the electric fields of proton and electron superpose one each other perfectly concentric, then the Coulomb force of attraction proton-electron is null, because the angle β would be zero for the whole interactions of fluxes, and in this case do not occur any interaction between the fluxes composed by positive and negative electricitons (they will move in the same direction with the speed of light, and therefore the interaction does not occur, because their relative speeds is zero). Therefore, the Coulomb's law actually varies from $F = K(Qq/d^2)$ and $F = 0$, and thereby there is a region near to the proton where the attraction force between the proton and electron is $F = K(Qq/d)$. Such region is in the range of the Bohr's radius, in order of 10^{-11}m, see Figure 3.

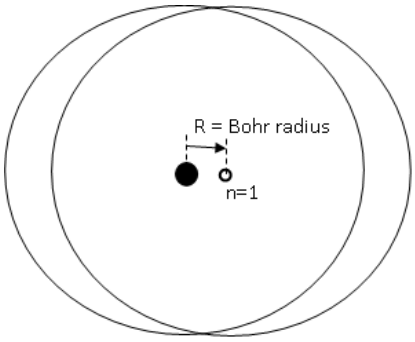

Fig 3. The electron in the level $n = 1$, where Coulomb law is $F = K(Qq/d)$.

CONDITIONS WHERE THE NEW COULOMB'S LAW IS APPLIED

From the structure of electric fields shown in the Figure 2, we realize that the repulsion between two protons occurs according to the New Coulomb Law is $F = K(Qq/d^X)$, with $X < 2$ for distances shorter than Bohr's radius. But note that $F = K(Qq/d^X)$ is applied only to the following condition: when two particles having the same sign of their electric charges do not have relative rectilinear motion between them. We realize that such condition is fulfilled for,

1-Quarks inside the structures of elementary particles as the proton, mesons, etc.

2-Protons inside the atomic nuclei

Unlike, when two protons have relative rectilinear motion along the same line of displacement, as occurs in the scattering experiments, from Figure 2(A) we realize that $F = K(Qq/d^X)$, with $X < 2$, no longer can be applied because;

1-When the protons A and B have no relative rectilinear motion between them, the electricitons of the string A_{RIGHT} of the proton A moves with speed $V = 2c$ regarding to the string B_{LEFT} of the proton B, and with speed zero regarding to the string B_{RIGHT}.

2- Unlike, in scattering experiments, where each of the two protons move with speed v, the electricitons of the string A_{RIGHT} of the proton A moves with speed $V = 2v + 2c$ regarding to the string B_{LEFT} of the proton B, and $V = 2v$ regarding the string B_{RIGHT}. In this condition, it is possible that, in the New Coulomb's Law, $F = K(Qq/d^X)$, the value of X can be even biggest than 2 in scattering experiments (and $X > 2$ means that the interaction force F is very, very strong in short distances $d \cong 1fm$).

THE ELECTRON TRAJECTORY IN THE HYDROGEN ATOM

Consider the electron moving with zbw inside the proton electrosphere in the hydrogen atom. According to Nassif's SSR (Nassif, 2016), there is no absolute rest, and inside an isotropic aether (far away the proton) a free electron can never move with a speed lower than a minimum speed. Moving with such minimum speed inside the isotropic aether, the Ro radius of the zbw is very big (tending to infinite). Let us call "quantum rest" such motion with minimum speed proposed by Nassif, for the isotropic vacuum. Nassif has applied his SSR so that to find a connection between the macroscopic world and the behavior of the elementary particles through the contribution of the aether, missing in Einstein's Relativity and in the Standard Model (where the gravity is missing), but he did not worry about the missing of the contribution of the aether inside the atomic nuclei and the atoms. This challenge was faced by the author of this paper, and he discovered the structure of the atomic nuclei, and also what is the aether contribution inside the atoms. Ahead is explained how an electron moves in the electrosphere of the atoms, according to his conclusions about the reasons why the atom model of Quantum Mechanics is denied by the spectacular successes of the Bohr hydrogen atom. If a magnetic field is applied and the free electron starts to accelerate inside this isotropic aether, the radius of its zitterbewegung (zbw) is submitted to a process of shrinkage, because the speed is increasing. While the shrinkage of the zbw radius, for the electron moving inside the isotropic vacuum, requires acceleration, unlike, the shrinkage of the zbw radius, inside an anisotropic aether (with gradient of density), occurs even with the electron moving with constant speed (as we will see ahead, this property of an aether with gradient of density explains the mystery of the Bohr's successes). In order to understand the electron motion inside the electrosphere of a proton, let us understand the mechanisms which rule the electron behavior as,

1- The strings composed by electricitons have ultra-high concentration in the vicinity of the proton. This is illustrated in Figure 4.

2- Such ultra-high concentration captures positive magnetons, thanks to the interaction between electricitons (moving with the speed of light) and the magnetons existing in the aether. Obviously, as the origin of the strings begins within the body of the proton, then the proton body is a place of higher density of positive magnetons, captured around the proton. And, also obviously, as the density of the field of strings decreases directly proportional to R^2 (because the strings cross the surface of a sphere, $4\pi R^2$), thus the density of the anisotropic field of magnetons decreases proportional to $1/R^2$. Therefore, the proton electrosphere is composed by two sort of fields: an anisotropic magneto-electric field around the proton body, and an electric isotropic field (which is around the anisotropic field). This is shown in Figure 5.

3- The same occurs in the case of the electron, and it captures negatives magnetons. Thus we realize that the proton and the electron constitute a magnet, with two north and south poles. And for a better understanding of what occurs between these two magnets, we will analyze what happens when we try to put two magnets close one each other, as seen in the Figure 6, where is shown a magnet with its two magnetic poles in (A), and the interaction of two magnets in (B) and (C).

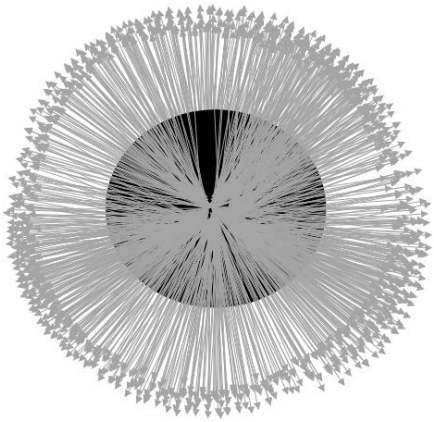

Fig 4. Ultra-high concentration of strings, of the electric field in the vicinity of the proton, spread in all directions

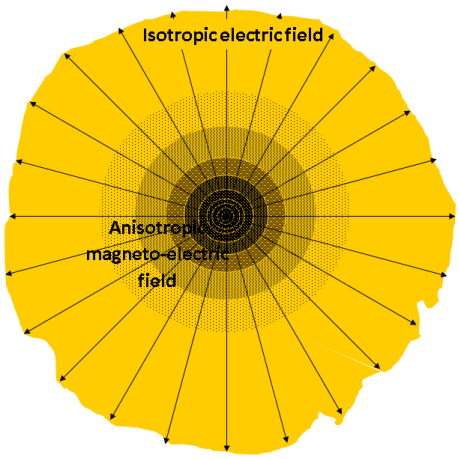

Fig 5. Proton field composed by isotropic and anisotropic fields

4- In Figure 6(A) we see that positive magnetons are concentrated in the south pole of the magnet, and the negative magnetons are concentrated in the north pole. In Figure 6(B) we try to putting in touch the two south poles of the two magnets. So, we have applied a force F, and we note that the two magneton fields react with a contrary force F, according to the Newton law of reaction. So, magnetons of the same sign do not accept to mix together. In Figure 6(C) the poles south and north are placed in touch, and we note that again the negative and positive magnetons do not mix together, in order to form a neutral magnetic field. Instead of, all the negative magnetons of the two old north poles move, in order to compose a new unique north pole, and the positive magnetons of the two old south poles move, in order to compose a new unique south pole.

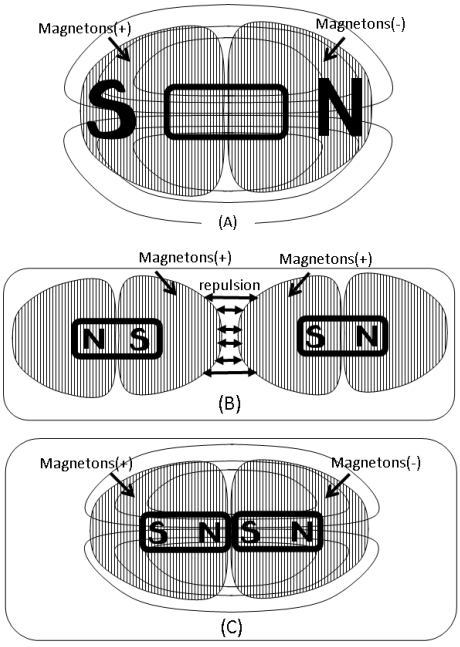

Fig 6. Interaction of magneton fields of two magnets

5- Now let us see what happens with the magnet formed by the proton-south-pole and the electron-north-pole. When the electron is very far away, it is attracted by the proton due to the interaction of their isotropic electric fields, according to Coulomb's law, $F = K(Qq/d^2)$. Along the whole trajectory of the electron, the proton-south and electron-north poles do not interact, and the electron moves with acceleration, with the radius of its zbw under the process of shrinkage. Photons are emitted in several levels of the isotropic electric field, as predicted in the Bohr theory, and as consequence the electron speed has a little decrease, after the emission of each photon. The electron finally arrives to the region where the anisotropic magneto-electric field begins, and the new Coulomb law , $F = K(Qq/d)$ starts to manifest itself, and the north and south poles of the magnet proton-electron starts to interact. The electron continues its radial motion toward the proton direction, emitting photons in the levels $n = 6, n = 5, n = 4 \ldots$ and it arrives to the level $n = 1$. During the motion up to arrive to $n = 1$, while the electron was attracted by a Coulomb force , $F_a = K(Qq/d)$(where F_a was increasing with the decrease of the distance d between the proton and the electron), the poles north and south have reacted, according to Newton's law, with a Fr force in contrary direction, $F_r = -F_a$, while Fr and Fa continued increasing together. As the electron is submitted to two contrary forces with equal intensity, in that region of anisotropic space it has moved as a free electron, with constant speed, in spite of it was subjected to the proton potential, inside the hydrogen atom. Such mechanism is the answer for the successes of Bohr's theory, and the reason why Schrödinger's equation can be applied for an electron inside a potential.

6- Note that the space is anisotropic for the electron moving in radial direction. For the electron moving with orbit radius R around the proton, the space ahead the electron motion is isotropic, because all the points of the electron trajectory have distance R to the proton, and obviously all the points with distance R to the proton have the same density of aether. This is illustrated in Figure 7, where the electron moves with zbw in orbit around the proton. Therefore, when the electron moves in circular orbit around the proton, as for instance in the level $n = 1$, there is no repulsion between the proton and electron, because it is zero the gradient of the density of the aether, ahead the electron motion. Moving with circular orbit in any level, the electron stays submitted only to the following four forces, F_C Coulomb attraction with the proton, F_M magnetic force due to the magnetic field induced by the charge of the electron moving about the proton, F_{mZ} magnetic force due to the electron orbit in the zbw, and F_{CF} centripetal force.

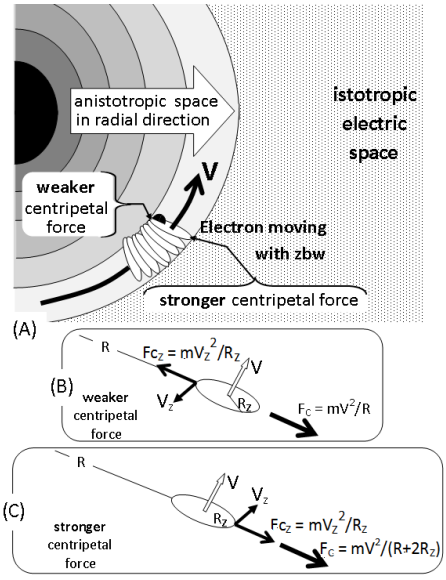

Fig 7. Electron moving with zbw, in circular orbit around the proton

7- The electron arrives to $n = 1$ moving along radial motion, with variables ahead, as speed V_1 , radius R_{Z1} (a maximum shrinkage of the zbw occurred in $n = 1$) F_{A1} Coulomb attraction force proton-electron; F_{mZ1} magnetic force due to zbw. In $n = 1$ the Coulomb law , $F = K(Qq/d)$ becomes, $F = K(Qq/d^{1/x})$. $F = K(Qq/d^{1/x})$, with x > 1, and so F_{R1} repulsion force becomes stronger than $F_{A1} + F_{mZ1}$ of attraction, and the electron starts to move with circular orbit about the proton, along fraction of seconds. Thus, moving with circular orbit, it has the following variables V_1, R_{Z1}, F_{A1}, F_{mZ1}, R_1 radius orbit around the proton, and F_{M1} magnetic force due to electron orbit about the proton. Because the trajectory has changed from radial to circular, the atom emits a photon in *n=1*. With the emission of the photon, V_1 has decreased to V_2, and R_{Z1} has dilated to R_{Z2}. As there is no F_R repulsion force with the electron moving in circular orbit, the electron jumps under the action of the centripetal force, getting again the radial trajectory, with the electron moving with constant speed V_2. Along the radial motion, R_Z zbw radius dilates, while F_{M1} magnetic force disappears. And when the zbw radius is in process of dilation, there is a superposition between two causes: due to F_{SK} force (which dilates the radius of the zbw) and due to stronger centripetal force $F_C + F_{CZ}$, shown in Figure 7(C). Under such superposition of forces, the electron is submitted to a tendency of changing the radial motion to a circular one. Therefore, the success for changing the radial motion to circular trajectory depends on the dilation of the R_Z zbw radius. But, when the electron passes by $n = 2$ and $n = 3$, the R_Z dilation is yet short, and by this reason there is no emission of photons in $n = 2$ and $n = 3$. Only when the electron arrives to $n = 4$, the R_Z dilation is enough to supply the suitable superposition between F_{SK} and $F_C + F_{CZ}$, and thus at $n = 4$ the electron orbit is changed, it starts to move with circular orbit about the proton, and a photon is emitted. In fraction of seconds the electron moves with circular orbit, and F_{M1} magnetic force reappears, causing a deviation in the circular orbit, and the electron starts to move back to $n = 1$ along radial trajectory. The speed experienced a little decrease, from V_2 to V_3 , after the emission of a photon in *n=4* (because any photon emitted in $n = 4$ is slight). The speed V_3 is yet very fast, and R_Z is very short, when the electron passes by *n=3* and $n = 2$, and so there is no emission of photons in those levels. Arriving to *n=1*, the radial trajectory changes to a circular one, the atom emits a photon, and the electron jumps, going to *n=4* again, the trajectory is changed in *n=4*, and the atom emits a second photon. The electron goes back to *n=1*, another photon is emitted in n=1, it goes back to n=4, a photon is emitted in *n=4*, and a sequence of photons are emitted with the electron jumping between *n=1* and *n=4*. Obviously, each photon emitted in *n=4* has different wavelength, because each one of them was emitted under different variables V, $R_Z, R, F_A, F_M,$ and F_{mZ}. Now, a next photon will be emitted, when the electron, coming from *n=4*, passes by *n=2*, as explained ahead.

A considerable portion of kinetic energy was wasted, with the emission of photons between *n=1* and *n=4*. The electron is moving with radial trajectory, coming from *n=4*, after the emission of the last photon, at *n=4*. Along the radial motion, going toward proton direction, R_Z zbw radius is under a process of shrinkage. And when the zbw radius is under a process of shrinkage, there is superposition between two causes, the F_{SK} force (which shrinkages the radius of the zbw) and the weaker centripetal force $F_C + F_{CZ}$, shown in Figure 7(B). Such superposition of forces causes the tendency of changing the radial motion to a circular one. Therefore, the success for changing the radial motion to circular trajectory depends on the shrinkage of the R_Z zbw radius. Therefore, there are two different conditions, when the radial trajectory changes to a circular one, when the electron is moving away of the proton (zbw dilates), and when it is approaching the proton (zbw shrinkages). Under process of zbw shrinkage, the change of radial to circular motion occurs when the electron is submitted to the weaker centripetal force, shown in Figure 7(B), While under process of zbw dilation, the change of radial to circular motion occurs when the electron is submitted to the stronger centripetal force, shown in Figure 7(C). Thereby, when the electron arrives to *n=2* (coming from *n=4*), the radial trajectory is converted to circular, in a moment when the electron is submitted to the weaker centripetal force, and a photon is emitted *n=2*. The electron continues moving with circular orbit, along a short time. The speed had a decrease, and the zbw radius had a dilation, Then, under the stronger centripetal force, shown in Figure 7(A), the electron jumps from *n=2* to *n=4*, and the atom emits a photon in *n=4*. This mechanism is repeated several times, with photons being emitted in *n=4* and *n=2*. In the next step, when the electron jumps from *n=2*, instead of to go to *n=4*, the electron emits a photon when it passes by *n=3*, and, moving in circular orbit at *n=3*, again under the action of the stronger centripetal force it jumps from *n=3* to *n=4*, where a photon is emitted. Several photons are emitted in *n=3* and *n=4*, with the electron jumping from *n=3* to *n=4*, many times. And finally, the energy of the electron, available for emission of photons by the atom, is exhausted, and the electron falls down to *n=1*, where it starts to move with circular orbit about the proton, with very low speed and a very big dilated zbw radius. Suppose the atom absorbs a big photon in *n=1*. The zbw radius has a little shrinkage, and the electron speed becomes a little faster, but the electron cannot jump, because the zbw radius is too much big (and therefore it is too much strong the proton-electron attraction, due to the strong F_{mZ1} magnetic force due to zbw radius), and the speed is too much low (and thereby the centripetal force is not able to supply the big jump from *n=1* to *n=4*). As the electron cannot jump, the atom continues absorbing more big photons in $n = 1$.

From this absorption of many photons in *n=1*, the electron is increasing its speed, and the zbw radius is continuously being compressed. As both magnetic attraction forces, F_{mZ} and F_M, depend on the speed of the electron, but they also depend on R_Z and R_1 (zbw radius and radius of the electron orbit about the proton), and they are in process of compression, therefore the attraction force proton-electron does not increase.

Unlike, the centripetal force grows with the square of the speed. Thereby, after absorption of several photons in *n=1*, when the stronger centripetal force exceeds the attraction between the proton and electron, finally the electron jump again from *n=1* to *n=4*.

8- Let us consider ρ_0 the density of the isotropic vacuum. Thus the density of the anisotropic aether inside the proton electric field is $\rho_0 = \rho_0.(d - R)^2$, where d is the distance between the proton and the place where the isotropic aether begins, and *R = 1, 2, 3…* are the radii in the Bohr theory.

9- We may expect that the mass of the electron (moving radially, in the anisotropic aether inside the proton electrosphere) is $m_n = m_0/n^2$, where *n=1, 2, 3…*, and m_o is

its mass in the level *n=1*, because the density ρ_1 (in the level *n=1* of the anisotropic field of magnetons) decreases proportional to $1/R^2$, $\rho_0 = (\rho_1/R^2)$.

10- In his theory, Bohr has considered as kinetic energy, for the electron in the hydrogen atom, the well-known equation $E_C = 0.5mV^2$. But as now we know that the electron actually moves with constant speed V (in the radial direction inside the hydrogen atom), then the kinetic energy is actually $E_C = 0.5V(\frac{m_o}{n^2})$, where $n = 1, 2, 3 \ldots$, and m_o is the mass of the electron in the level $n = 1$. But it's not the mass of the electron which changes. What changes is actually the electron's inertia, regarding the proton. Let us clarify such concept. Suppose that a free electron in the isotropic space, far away of the proton influence, is submitted to a force F, and the electron acquires an acceleration a, $a = F/m$. If this electron is inside the anisotropic space inside the atom, then if we apply the same force F on the electron (toward the radial direction) its acceleration is $a = F/(\frac{m_0}{n^2})$, where "n" is the level where the electron is situated. Therefore, the same force F produces, in the electron, different accelerations, depending on where it is situated. In the isotropic vacuum the acceleration a is greater than inside the anisotropic aether inside the atoms. So, what increases with the Lorentz factor is not the mass, but actually the inertia. The mass of a body depends on the quantity of protons, neutrons, and electrons which compose it. The mass is constant. What varies is the inertia, and the variation depends on,

1- If the body is moving, its inertia depends on its speed regarding the aether, inasmuch as the interaction of the electric fields, of the particles which compose body, with the aether, causes the growth of the inertia.

2- If the body is at rest, its inertia depends on the density of the aether, where the body is.

Figures 8, 9, and 10, illustrate the coincidences responsible for the successes of the Bohr's theory, explained herein.

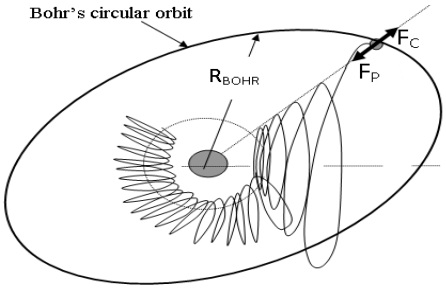

Fig 8 . How happens in the Bohr's calculus: The proton F_P force on the electron is equilibrated by the centripetal F_C force due to the electron circular orbit around the proton

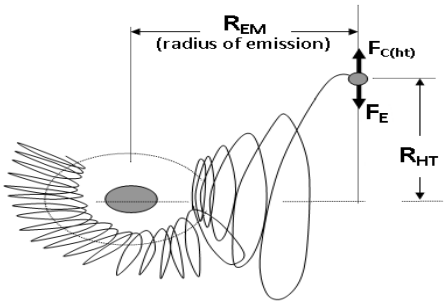

Fig 9. How actually happens in the atom

In the Figure 9 we have, 1-The centripetal $F_{C(ht)}$ force due to the R_{HT} radius of the helical trajectory is equilibrated by the F_E force of interaction with the ether (the F_E force keeps the electron in its helical trajectory). 2-In the moment of photon emission there is

$$R_{EM} = R_{HT} = R_{Bohr}$$

$$F_{C(ht)} = F_E = F_C = F_P$$

and this explains the success of Bohr's calculus

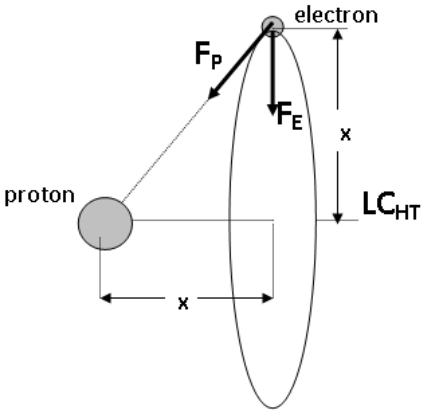

Fig 10 . Schrödinger's potential

In Figure 10 we have, 1-Schrödinger has considered the variable $V(x,t)$ potential due to the proton attraction on the electron, and therefore the proton would be the center of the $V(x,t)$ potential. 2-Actually such a potential is due to the ether attraction, keeping the electron in its helical trajectory. The center of the $V(x,t)$ potential is the LC_{HT} line center of the helical trajectory.

HOW BE11 HALO NEUTRON IS BOUND

In 2009, for the first time, scientists had measured the size of one-neutron halo with lasers (Nörtershäuser et al., 2009), and the measurement proved that nucleons are not bound within the nuclei via strong force, because in the 4Be11, the halo-neutron is 7fm far away from the rest of the cluster, and since the strong force actuates in a maximum distance shorter than 3fm, it is suggesting that the neutron is not bound via the strong force in the Be11. Some nuclear theorists have speculated so that to solve the puzzle, and Nörtershäuser proposed the following bizarre theory.

The riddle as to how the halo neutron can exist at such a great distance from the core nucleus can only be resolved by means of the principles of quantum mechanics: In this model, the neutron must be characterized in terms of a so-called wave function. Because of the low binding energy, the wave function only falls off very slowly with increasing distance from the core. Thus, it is highly likely that the neutron can expand into classically forbidden distances, thereby inducing the expansive heiligenschein. But beyond the fact that such theory is very strange, since it is proposed a sort of neutron which behaves like a rubber band able to stretch more than seven times its original size, the theory is also unacceptable, because,

1) Suppose that the theory was viable and wise, and the neutron indeed could have the strange property of behaving like a rubber band. However, the theory cannot explain other experimental fact: the 4Be11 decay produces the stable isotope 5B11, and there is no way to explain it by considering the hypothesis of the rubber band neutron.

Indeed, the hypothesis is also unacceptable because of the feature of the decay of the nucleus 4Be11, as explained ahead:

2) One could argue that the halo-neutron is weakly bound to the cluster, and it exits the nucleus after the 13,81 seconds just because of the weak link. However, this is no true, because in 97% of decays 4Be11 transmutes to 5B11, and therefore the neutron does not exit the nucleus. In the 4Be11 the neutron decays into a proton and electron, and the proton turns to the core. If the strong nuclear force was responsible for the cohesion of nuclei as the nuclear theorists suppose, the proton could never go back to the core, because in a distance of 7fm it cannot interact with the cluster via strong force, and the classical Coulomb repulsion between the cluster and the proton would be so strong that the proton would be expelled from the 4Be11 so that 5B11 could not be formed in 97% of the 4Be11 decay.

3) Therefore, even if the bizarre solution was viable for the explanation of the halo neutron in a distance of 7fm from the rest of the nucleus, however the 5B11 would never be formed from the decay of the 4Be11, according to the proposed solution.

4) And the theorists did not propose any explanation for the formation of the isotope 5B11 from the decay of the 4Be11. They only tried to explain how a neutron could be kept in a distance of 7fm.

5) But the explanation is unacceptable, and thereby it is impossible to explain the 7fm distance of the neutron in the Be11 by considering the current nuclear models based on the SNP. And therefore the 7fm distance detected in the experiment demonstrates that nucleons are not bound into nuclei via the strong nuclear force.

The neutron halo Be11 puzzle is solved by considering the present theory of interaction between electric fields. Figure 11 shows the interaction between the electric fields of two protons, and we realize that, when the two protons are very near one each other, in distances of the order of 10^{-15}m, the electric repulsion is very weaker than that occurred in the atoms, where the traditional Coulomb law $F = K(Qq/d^2)$ becomes $F = K(Qq/d)$. Thus we understand that there is no need to consider that nucleons inside the atomic nuclei are bound via strong nuclear force, because the Coulomb repulsion in the range of few femtometers (the diameter of atomic nuclei) is weak, and so nucleons can be bound via spin-interactions working together with magnetic interactions. In the case of Be11 nucleus, the halo neutron does not move back to the central core, because their spin and magnetic interaction, working together, are unable to promote the return of the neutron. But when the neutron decays in a proton, its spin and magnetic interaction with the core is stronger, and so the proton goes back to the rest of the newborn stable 5B10. The proton is able to go back only because the Coulomb repulsion on it is very weak. And as the Coulomb force is weak, the centripetal force on the protons and neutrons plays a fundamental role for the equilibrium of the nuclei. The stability of stable nuclei is promoted by the balance between two attraction forces (promoted by spin-interaction and magnetic forces) and the centripetal force trying to expel the nucleons.

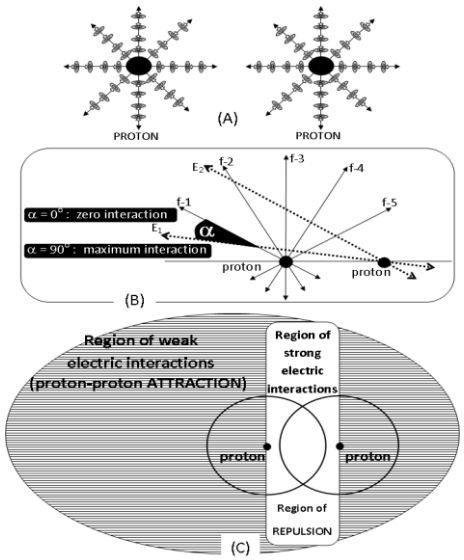

Fig 11. Interaction between electric fields of two protons

Concerning hot nuclear fusion, there is need to clarify a point, because if only the isotropic electric field of proton would prevent the hot fusion occurrence, then inside the stars hot fusion would occur very easily, because, inside the stars, the isotropic electric field is compressed, and by having an extension shorter than the Bohr's radius, the Coulomb repulsion inside the stars would have to follow the law $F = K(Qq/d)$ (or even $F = K(Qq/d^X)$, where $X < 1$) , and the stars would waste their hydrogen fuel in a time very shorter than they do. Then there is need to explain that, in order to occur hot fusion, two conditions must be satisfied.

1- First of all, two nucleons with positive electric charge must be placed together into a region, with a distance between them, of the order of few femtometers. This requires a big energy, because the known Coulomb force, $F = K(Qq/d^2)$, acts fully until distances of the order of the Bohr radius, $R = 10^{-11}$m.

2- The proposal of a New Coulomb Law $F = K(Qq/d)$ is applied for the electron only, and the reason is explained as follows. When a positively charged nucleon succeeds to cross the isotropic proton field, an additional energy is required for the occurrence of hot fusion, because the proton anisotropic magneto-electric field also requires an extremely high energy, in order to occur hot fusion. Such anisotropic magneto-electric field of the proton is named *Principal Field Sp(p)*, and its structure is shown in Figure 12. Similarly, the atomic nuclei have a Principal Field Sp(n), and the electron has a *Principal Field Sp(e)*. The proton principal field Sp(p) has rotation, and the isotropic electric field of the proton is actually induced by such rotation of the principal field. It is not the spin of the proton body which induces the isotropic electric field (as said in the beginning of the present paper, and it was said for simplifying the explanation in the beginning). The correct sequence of induction is the following: the spin of the proton body induces the field Sp(p), whose rotation excites the aether, inducing the isotropic electric field of the proton. However, the rotation of such field Sp(p) would have to induce a very big magnetic moment, since it has a radius which extension is equal to the Bohr radius. And the proton has not such enormous big magnetic moment. Figure 12 explains why the

Principal Field Sp(p) does not induce any magnetic moment, and the explanation is related to the gradient of the anisotropic aether that composes the field Sp(p). However, this is a topic to be addressed in another paper. An important fact concerning the field of Nuclear Physics is the following: in the case is correct the present theory, which was developed by considering the participation of the aether in atomic and nuclear physics, this means that atomic nuclei are not bound via the strong nuclear force. Because when the nuclear fusion occurs, inside the atomic nuclei the protons and neutrons are not submitted to a strong Coulomb repulsion, as considered in the SNP. And so protons and neutrons can be bound by magnetic forces and spin-interactions.

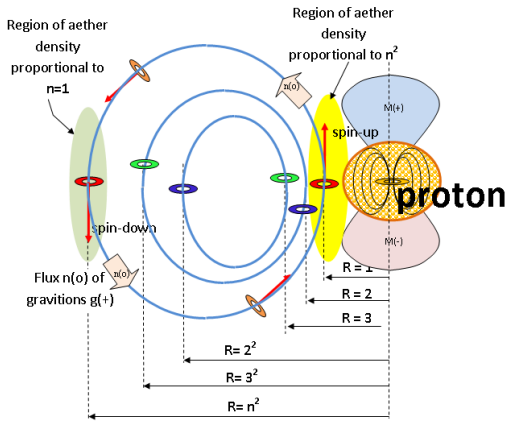

Fig 12. The proton and its principal anisotropic field Sp(p)

In the Figure 12 we have: The principal anisotropic field Sp(p) is induced by the spin of the proton. The rotation of the field Sp(p) induces the isotropic electric field of the proton (which is not shown in the figure). The proton charge $+1.6 \times 10^{-19}$ C is produced by the isotropic field.

PRESENT SITUATION OF NUCLEAR PHYSICS REQUIRES A NEW NUCLEAR MODEL, WHERE THE PARTICLES OF AETHER MUST PLAY FUNDAMENTAL ROLES

According to the SNP, atomic nuclei at the ground state cannot rotate, because such rotation would induce a nuclear magnetic moment, due to the electric charge of the protons in rotation. As even-even nuclei, with equal number of protons and neutrons, have null nuclear magnetic moment, then it is obvious that, according to SNP, the atomic nuclei at the ground state cannot have rotation. In 2015 the author had a discussion with the Nobel Prize Brian Josephson via exchange of several emails, along three months. Among the many subjects of the discussion, one of them was the rotation, of even-even nuclei with $Z = N$, at the ground state. The author published in Amazon.com a book (Guglinski, 2015), and Dr. Josephson posted a comment, trying to refute the author's claim that current nuclear models cannot explain the null magnetic moments of the even-even nuclei with $Z = N$. The argument used by the Nobel Prize was the following, His error lies in the assumption that as nuclei can rotate they must be rotating, which is clearly not the case. There is absolutely no mystery about the zero magnetic moment it is to be expected for symmetry reasons in a state with zero spin, no detailed calculation being necessary. These nuclei do have rotational excited states, but in their ground state they do not rotate and have spherical symmetry. He signed his comment as Brian, and quoted the book as Bad Physics. But Dr. Josephson was not aware that, in 2012, a new experiment detected a new nuclear property, of the even-even nuclei with $Z = N$, which requires their rotation at the ground state. The reason is explained ahead. According to SNP, even-even nuclei with equal number of protons and neutrons must have spherical shape. But the 2012 experiment has proven that they actually have ellipsoidal shape (Ebran, Khan, Nikšić, & Vretenar, 2012). The authors of the paper propose How the nuclei cluster, but they do not explain Why even-even nuclei with $Z = N$ have ellipsoidal shape, and the reason is obvious: because it is impossible to explain the ellipsoidal shape of those nuclei by considering the foundations of the SNP. And there is other additional puzzle threatening the SNP, because nuclei with ellipsoidal shape cannot have null electric quadrupole moment Q but experiments have detected that those nuclei have $Q = 0$.

In order to explain why they have $Q = 0$, there is need to consider that they have rotation at the ground state. And having rotation they cannot have null magnetic moment, detected by experiments. As one realizes, it is impossible to solve the puzzle of the even-even nuclei with equal number of protons and neutrons, by considering the foundations of the SNP. The puzzle does not exist when we consider the new nuclear model proposed in the paper Calculation of magnetic moments of light nuclei with number of protons between $Z = 3$ and $Z = 30$, (in the process of publishing with IJFPS), where it is shown that atomic nuclei have two magnetic poles, north and south. So, due to the rotation of the nucleus at the ground state, occurs the following,

A. The electric charge of a proton in the north pole induces a positive magnetic moment.

B. The electric charge of a proton in the south pole induces a negative magnetic moment.

C. For atomic nuclei with pair number of protons, half of them are situated in the north pole, and half in the south pole. And therefore it is null the total magnetic moment induced by the electric charges of all protons, by the rotation at the ground state.

From the foundations of the SNP, it is impossible to have two magnetic poles, north and south, in the current nuclear models. And then, being impossible to consider two magnetic poles inside the structure of the atomic nuclei, that was the reason why, before 2012, the nuclear theorists had no other alternative beyond to believe that even-even nuclei with $Z = N$ do not rotate in the ground state. Of course they could never imagine that in 2012 a new experiment would detect that those nuclei have ellipsoidal shape. A nightmare they could never wait. So, it is impossible to solve so many puzzles, in the field of nuclear physics, by keeping the current foundations of the SNP. And there are many other new experiments, published in the last five years, showing that the foundations of the SNP are in an irreversible process of disintegration. For instance, we may mention the experiment (Gaffney et al., 2013), which detected that $Ra224$ and $Rn220$ are pear shaped, which is impossible by considering the foundations of the SNP. But, as it was shown herein, the puzzles in the field of Nuclear Physics have connection with some puzzles of the field of Atomic Physics, and the reason of such connection lies in the fact that both theories were developed by neglecting the influence of the aether in the atomic and nuclear properties.

CONCLUSIONS

The reevaluation of the atom model of Quantum Mechanics is required by some scientific true facts mentioned below.

1- First fact: The Schrödinger's equation, from which was born the atom model of QM, paradoxically is incompatible with QM.

2- Second fact: From the first fact we realize that Schrödinger's equation is not related to the atom of QM, where the space inside the atom is considered isotropic. His equation is related to an atom inside which the space is anisotropic.

3- Bohr's successes cannot be accidental, as well emphasized by Schrödinger, meaning that QM cannot be hundred percent correct, which imply that something very fundamental is missing in the current model of atom.

4- As Bohr cannot be hundred percent wrong, and in his model he had considered the centripetal acceleration on the electron when the atom emits photons, this means that the atom model adopted in QM cannot be hundred percent correct, since the existence of the centripetal acceleration on the electron is impossible to exist, according to the atom mode of QM.

Among the fundamental targets of the scientific method, one of the most important is the search for theories free of unacceptable paradoxes. The probability, for a theory to represent a true picture of the nature, can be measured by the inverse the number of paradoxes generated by the theory. The higher is the number, the less is the chance of the theory to be correct. Neglecting the paradoxes of the atom model of QM is not a procedure agree to the scientific criterion. Because, if a theorist says; The failure of the atom model of Quantum Mechanics does not mean we need to abandon completely the current theoretical paradigm of the atom structure. In other words, one does not need attacking a theory that nobody thought was correct, such opinion does not reflect what we understand as a search for the scientific true. Actually is a pseudoscientific way of argumentation. Other important conclusion is about the fact that nowadays we don't know the laws of interaction aether-matter, because along more than 100 years the aether was neglected in the Theoretical Physics. The consequence, we have been noting along the last 10 years, the most fundamental principles of Modern Physics are being demolished by recent experiments.

The final conclusion is: we cannot continue neglecting the aether, otherwise the theorists will never succeed to develop a theory compatible with the upcoming experiments to be made in the next years.

Finally, let us consider the introduction of the extraordinary claim on the existence of the n(o)-flux in the structure of the electromagnetic field of the elementary particles. As said Carl Sagan, extraordinary claims require extraordinary evidence, which perhaps will be discovered between 2018 and 2019, when the proton radius will be measured in the PSI proton accelerator (Kohl, 2014). Guglinski (2018) has calculated that proton radius, to be measured in the experiments, must be found between 0,62fm and 0,72fm. If this prediction be confirmed by the MUSE Project, it is out of doubt that such result will require a New Physics, with some new principles which are missing in the Standard Model. And so seems that the adoption of the existence of the n(o)-flux will be unavoidable.

ACKNOWLEGMENTS

The author dedicates this work to his son Douglas and daughter Ana, and to his brother Sacha and sister Lena.

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